United Electronic Industries

The High-Performance Alternative

DNA/DNR-DIO-470

—

User Manual

10-Channel Electromechanical-Relay Layer with high-current digital input/outputs for the PowerDNA Cube and PowerDNR RACKtangle

Release 4.5

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PN Man-DNx-DIO-470-712

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Chapter 1 Introduction

This document outlines the feature-set and use of the DIO-470 layer. This layer is an electromechanical relay interface module for the PowerDNA I/O Cube and RACKtangle.

1.1 Organization of Manual

This DIO-470 User Manual is organized as follows:

- **Introduction**
  This section provides an overview of DIO-470 High-current Electro-mechanical board features, the various models available and what you need to get started.
- **The DNA/DNR-DIO-470 Electromechanical Relay Layer**
  This chapter provides an overview of the device architecture, connectivity, and logic of the DIO-470 layer.
- **Programming with the High-Level API**
  This chapter provides an overview of the how to create a session, configure the session for relay drive/output, and interpret results on the DIO-470 series layer.
- **Programming with the Low-Level API**
  Low-level API commands for configuring and using the DIO-470 series layer.
- **Appendix A - Accessories**
  This appendix provides a list of accessories available for use with the DIO-470 layer.
- **Index**
  This is an alphabetical listing of the topics covered in this manual.

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1.2 Manual Conventions

To help you get the most out of this manual and our products, please note that we use the following conventions:

Tips are designed to highlight quick ways to get the job done or to reveal good ideas you might not discover on your own.

NOTE: Notes alert you to important information.

CAUTION! *Caution advises you of precautions to take to avoid injury, data loss, and damage to your boards or a system crash.*

Text formatted in **bold** typeface generally represents text that should be entered verbatim. For instance, it can represent a command, as in the following example: “You can instruct users how to run setup using a command such as **setup.exe**.”

Text formatted in `fixed` typeface generally represents source code or other text that should be entered verbadim into the source code, initialization, or other file.

Usage of Terms

Throughout this manual, the term “Cube” refers to either a PowerDNA Cube product or to a PowerDNR RACKtangle™ rack mounted system, whichever is applicable. The term DNR is a specific reference to the RACKtangle, DNA to the PowerDNA I/O Cube, and DNx to refer to both.

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1.3 The DIO-470 Layer

The DIO-470 is a 10-channel Electromechanical Relay Output layer designed for driving solenoids, motors, or other inductive loads. The board's 10 independent digital outputs are configurable to provide output control and switching (up to 750VA) for 10 channels (total).

The board is available in two versions: the DNA-DIO-470 for mounting in UEI Cube products, and the DNR-DIO-470 for insertion into the UEI RACKtangle and HalfRACK chassis.

The technical specifications for the DIO-470 are listed in the table below:

Table 1-1. DNx-DIO-470 Technical Specifications

Output specifications	
Rated Load	5 A at 125 VAC, 5 A at 30 VDC, 0.4 A at 125 VDC continuous
Recommended inteconnect wire size	22 gauge or larger
Circuit protection	7 A slo-blow fuse on each "Com" connection
Max Switching Capacity	750 VA
Max Operating Voltage	140 VDC, 150 VAC
Min Permissible Load	10 µA, 10 mVDC
Contact Material	AgSnO2
Contact OFF impedance	>100 MOhm
Off Leakage Current	< 100 µA
Turn-On Time	8 mS (typical)
Turn-Off Time	8 mS (typical)
Max Operating Freq.	125 operations/second)
Service Life	
Mechanical	100,000,000 min
Electrical	100,000 at full rated load
Power up / reboot state	Off (NC Energized)
Power dissipation	< 3 W
Isolation	350 Vrms
Operating Temp. Range	Tested -40 to +85 °C
Operating Humidity	95%, non-condensing
Vibration *IEC 60068-2-6* *IEC 60068-2-64*	5 g, 10-500 Hz, sinusoidal 5 g (rms), 10-500 Hz, broad-band random
Shock *IEC 60068-2-27*	50 g, 3 ms half sine, 18 shocks @ 6 orientations 30 g, 11 ms half sine, 18 shocks @ 6 orientations
MTBF	260,000 hours

1.4 Features

The main features of the PowerDNx DIO-470 Relay Drive Output Layer are:

- 10 Form C electromechanical relay outputs (total)
- 5A @ 30VDC or 0.4A @125 VAC continuous per channel maximum current rating
- Ideal for driving solenoids, motors, or other inductive loads
- Output Throughput rate 125 updates per second max
- Guaranteed output OFF state on initial power-up, external power OFF, internal power OFF, and overload detected
- Isolation of 350VDC between channels, and other components.
- Output OFF leakage <100 uA

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1.5 Device Architecture

The DNx-DIO-470 Layer has 10 Form C relay outputs. A block diagram of the board is shown in **Figure 1-1**.

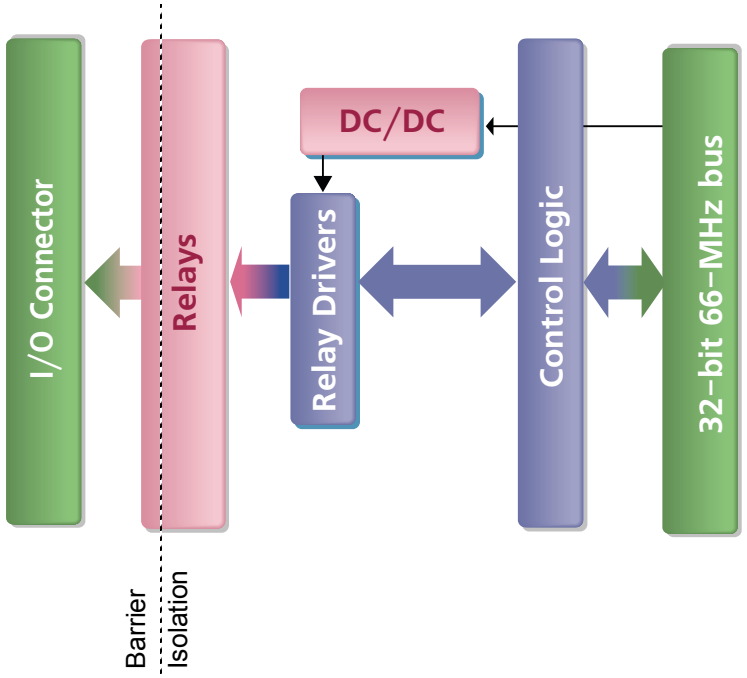
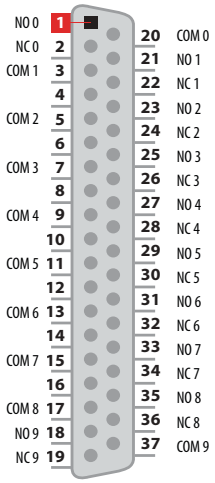


Figure 1-1. Block Diagram of DNA-DIO-470

Note that the I/O part of the layer is isolated from the logic interface.

1.6 Layer Connectors and Wiring

The pinout of the DB-37 37-pin female connector for the DNx-DIO-470 Layer board is shown in **Figure 1-2**.



NOTE: The standard DNA-CBL-37 and DNA-STP-32 will not handle 5A currents. Please use only the DNA-CBL-37HC and DNA-STP-37HC with the DIO-470.

Figure 1-2. DB-37 I/O Connector Pinout for DIO-470

For software compatibility with other UEI DIO products, the 10 output groups of the DIO-470 are numbered from NO-0, NC-0, COM-0 through NO-9, NC-9, COM-9. Note that the output of each channel is a set of three pins for NC contacts, NO contacts, and COM.

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Before plugging any I/O connector into the Cube or Layer, be sure to remove power from all field wiring. Failure to do so may cause severe damage to the equipment.

The figure below shows the DNR-DIO-470 version of the DIO-470.The DNA-DIO-470 version is functionally identical except that it is designed for insertion into a UEI cube-type chassis. The board consumes two layer slot: one for the board itself and another above it as a spacer for the electromechanical relays.

The front panel has two LED indicators:

- RDY: indicates that the layer is receiving power and operational.
- STS: can be set by the user using the low-level framework.

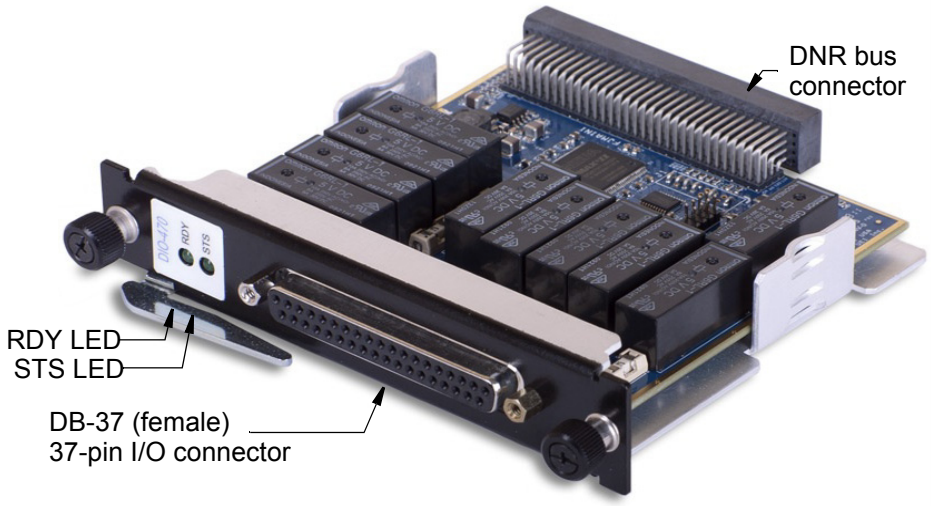

Figure 1-3. The DNR-DIO-470 Counter-Timer Layer

1.7 Anti-Kickback Diodes

The DIO-470 can drive solenoids, motors, or other high-current inductive loads. An anti-kickback diode must be installed (with attention to polarity) on each such input to avoid voltage kickback into the DIO-470 layer and‘ other control circuitry.

Use of the DIO-470 to drive inductive loads requires installation of anti-kickback diodes on each such output. Installation of these diodes is the responsibility of the user. Failure to provide these diodes can cause damage to components of the board.

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Chapter 2 Programming with the High Level API

This section describes how to control the DNx-DIO-470 using the UeiDaq Framework High Level API.

UeiDaq Framework is object oriented and its objects can be manipulated in the same manner from different development environments such as Visual C++, Visual Basic or LabVIEW.

The following section focuses on the C++ API, but the concept is the same no matter what programming language you use.

Please refer to the “UeiDaq Framework User Manual” for more information on use of other programming languages.

2.1 Creating a Session

The Session object controls all operations on your PowerDNx device. Therefore, the first task is to create a session object:

```
// create a session object

CUeiSession session;
```

2.2 Configuring the Resource String

UeiDaq Framework uses resource strings to select which device, subsystem and channels to use within a session. The resource string syntax is similar to a web URL:

```
<device class>://<IP address>/<Device Id>/<Subsystem><Channel list>
```

For PowerDNA and RACKtangle, the device class is **pdna**.

For example, the following resource string selects digital output lines 0,1,2,3 on device 1 at IP address 192.168.100.2: “pdna://192.168.100.2/Dev1/Do0:3”

2.3 Configuring for Digital I/O

The DIO-470 can be configured for digital output.

NOTE: In Framework, a digital channel corresponds to a physical port on the device. You cannot configure a session only to access a subset of lines within a digital port.

NOTE: Sessions are unidirectional. The DIO-470 is also unidirectional and you only need to configure one session for output.

The following snippet configures the digital ports of a DIO-470 set as device 1:

```
// Configure session to write to ports 1 to 3 on device 1

session.CreateDOChannel(“pdna://192.168.100.2/Dev1/Do1:3”);
```

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2.4 Configuring the Timing

You can configure the DIO-470 to run in simple mode (point by point) only. Use of ACB mode is not currently supported.

In simple mode, the delay between samples is determined by software on the host computer.

The following sample shows how to configure the simple mode. Please refer to the “UeiDaq Framework User’s Manual” to learn how to use other timing modes.

```
// configure timing for point-by-point (simple mode)
session.ConfigureTimingForSimpleIO();
```

2.5 Data Aquisition

Writing data is done using a writer object.

The following sample shows how to create a writer object and write data:

```
// create a writer and link it to the session’s stream
CUeiDigitalWriter writer(session.GetDataStream());
// to write a value, the buffer must contain one value per channel
uInt32 data = 0xFEFE;
// write one scan, the buffer must contain one value per channel
writer.WriteSingleScan(&data);
```

2.6 Cleaning-up the Session

The session object will clean itself up when it goes out of scope or when it is destroyed. To reuse the object with a different set of channels or parameters, you can manually clean up the session as follows:

```
// clean up the session
session.CleanUp();
```

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Chapter 3 Programming with the Low Level API

The low-level API offers direct access to PowerDNA DAQBios protocol and allows you to directly access device registers.

Where possible, we recommend that you use the UeiDaq Framework (*see Chapter 2*), which is easier to use.

You should need to use the low-level API only if you are using an operating system other than Windows.

Please refer to the `API Reference Manual` document under:

Start » Programs » UEI » PowerDNA » Documentation

for pre-defined types, error codes, and functions for use with this layer.

For a good starting point, please consider reviewing the examples for DIO layers that are under:

Start » Programs » UEI » PowerDNA » Examples

3.1 Low–Level Functions

The low-level digital output functions for a DIO-470 layer are described in the PowerDNA API Reference Manual Release 4.5, and are provided below for reference:

Function	Description
`DqAdv40xWrite`	Writes a 10-bit word to a DI-470 layer using DQCMD_WRCHNL.
`DqAdv470Settings`	Sets up delay and dynamic control supported by the DIO-470.

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Appendix

A. Accessories

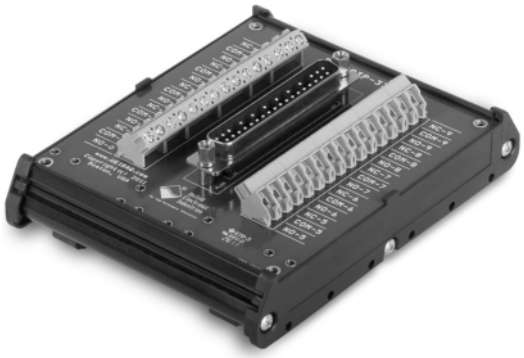
The following cables and STP boards are available for the DIO-470 layer.

DNA-CBL-37HC

A 37-way cable that connects the layer to a terminal panel that is 3ft to 12ft long; for use with loads up to 5A. Please ensure that your cable is a DNA-CBL-37HC for high amperage, and not the low-amperage DNA-CBL-37 (less than 2A).

DNA-STP-37HC

37-way screw terminal panel; for use with loads up to 5A.
Not to be confused with the low-amperage DNA-STP-37.



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